

CLAIMS

What is claimed is:

1. A method, comprising:
 - a) providing: i) a reaction vessel, ii) a heat source, iii) an active cooling means and iv) reactants;
 - b) introducing said reactants to said reaction vessel to create a solution comprising a bottom solution surface and a top solution surface; and,
 - c) applying heat to said bottom solution surface with said heat source and cooling said top solution surface with said active cooling means under such conditions that a temperature differential of at least 5°C is established between said bottom solution surface and said top solution surface and a convection cell is established.
2. The method of Claim 1, wherein said reactants comprise i) nucleic acid comprising a target and ii) primers substantially homologous to at least a portion of said target.
3. The method of Claim 2, wherein reactant products are produced.
4. The method of Claim 3, wherein products comprise amplified nucleic acid.
5. The method of Claim 1, wherein said reaction vessel comprises at least one material selected from the group consisting of Plexiglas™, glass, plastics, silicones and metal.
6. The method of Claim 1, wherein said reaction vessel is part of an array.
7. The method of Claim 1, wherein a temperature differential of at least 10°C is established between said bottom solution surface and said top solution surface and a convection cell is established.

8. The method of Claim 1, also providing at least one microdroplet channel wherein said microdroplet channel is in fluid communication with said reaction vessel.
- 5 9. A system comprising i) a reaction vessel having a top and bottom suitable for establishing a convection cell with a temperature differential of at least 5°C between the bottom of said vessel, ii) a heat source positioned at the bottom of said reaction vessel, iii) a cooling source positioned at the top of said reaction vessel and iv) a solution of biomolecules.
- 10 10. The system of Claim 9, wherein said biomolecules are PCR primers.
- 11 11. The system of Claim 9, wherein said reaction vessel is comprised of material selected from a group consisting of Plexiglas™, glass, plastics, silicones and metal.
- 12 12. The system of Claim 9, wherein said reaction vessel is part of an array.
- 13 13. The system of Claim 9, wherein said reaction vessel is in fluid communication with at least one microdroplet transport channel.
- 15 14. A method, comprising:
 - a) providing: i) a reaction vessel, ii) a heat source and iii) reactants;
 - b) introducing said reactants to said reaction vessel to create a solution comprising a bottom solution surface and a top solution surface; and,
 - 20 c) applying heat to said bottom solution surface with said heat source and cooling said top solution surface by passive cooling under such conditions that a temperature differential of at least 5°C is established between said bottom solution surface and said top solution surface and a convection cell is established.

15. The method of Claim 14, wherein said reactants comprise i) nucleic acid comprising a target and ii) primers substantially homologous to at least a portion of said target.
16. The method of Claim 15, wherein reactant products are produced.
- 5 17. The method of Claim 16, wherein products comprise amplified nucleic acid.
18. The method of Claim 14, wherein said reaction vessel comprises material selected from the group consisting of Plexiglas™, glass, plastics, silicones and metal.
19. The method of Claim 14, wherein said reaction vessel is part of an array.
- 10 20. The method of Claim 14, wherein a temperature differential of at least 10°C is established between said bottom solution surface and said top solution surface and a convection cell is established.
21. The method of Claim 14 further providing at least one microdroplet channel wherein said microdroplet channel is in fluid communication with said reaction vessel.
- 15 22. A method, comprising:
- a) providing: i) a reaction vessel configured with a width between 1 mm and 3 mm and with a height of less than about 10 times said width, ii) a heat source, iii) a cooling means and, iv) reactants;
- 20 b) introducing said reactants to said reaction vessel to create a solution comprising a bottom surface and a top surface; and,
- c) applying heat to said bottom solution surface with said heat source and cooling said top solution surface with said cooling means under

such conditions that a temperature differential of at least 5°C is established between said bottom solution surface and said top solution surface and a convection cell is established.

- 5 23. The reaction vessel of Claim 22, wherein in cross section the reaction vessel is without corners.
24. The reaction vessel of Claim 22, wherein in cross section the reaction vessel is with corners.
- 10 25. The method of Claim 22, wherein said reactants comprise i) nucleic acid comprising a target and ii) primers substantially homologous to at least a portion of said target.
26. The method of Claim 25, wherein reactant products are produced.
27. The method of Claim 26, wherein products comprise amplified nucleic acid.
- 15 28. The method of Claim 22, wherein said reaction vessel comprises material selected from the group consisting of Plexiglas™, glass, plastics, silicones and metal.
29. The method of Claim 22, wherein said reaction vessel is part of an array.
30. The method of Claim 22, wherein a temperature differential of at least 10°C is established and a convection cell is established.
- 20 31. The method of Claim 22 further providing at least one microdroplet channel wherein said microdroplet channel is in fluid communication with said reaction vessel.